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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/671,332	09/24/2003	Ammar Derraa	2269-7416.1US(98-0717.01/	5696

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EXAMINER	
GUHARAY, KARABI	
ART UNIT	**PAPER NUMBER**
2879	

DATE MAILED: 07/20/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/671,332	DERRAA, AMMAR	
	Examiner	Art Unit	
	Karabi Guharay	2879	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *Amendment, filed on 5/8/06*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *35-38,41-47,49-51,53-55,57 and 58* is/are pending in the application.

4a) Of the above claim(s) *35-37 and 41-46* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *38,47,49-51 and 53-55, 57-58* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Amendment, filed on 8 May 2006, has been considered and entered.

Claims 47, 51 & 55 have been amended.

Claims 48, 52 and 56 are cancelled.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 47, 50-51, 54-55 & 58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jones et al. (US 5663608) and further in view of Marieb et al. (US 5909635).

Regarding claims 47, 51 & 55 Jones discloses an integrated circuit (see Figs 5-7, & Fig 26- 27) including a substrate (10, 412, 452) comprising silicon (lines 45-47 of column 5), a first device (multiplicity of emitter 472 of Fig 27), a second device (a conductive grid gate 466), a second layer of material (a dielectric layer 458, 460, 462, 464) comprising silicon (line 40 of column 18), a conductor layer (454, 414) electrically connecting the first device (emitters) to the second device (gate), at least a portion of the conductor disposed adjacent to the first layer (substrate 452, 412), the conductor including a first part, and a second part, the first part comprising chromium and the second part comprising a second conductive material (lines 63-64 of column 22). Jones further discloses that the first part (Cr) is covering upper and lower surface of the second part.

But Jones et al. fail to disclose that the first part is forming a sheath completely wrapped around an upper surface, lower surface, a left edge, and a right edge of the second part.

However, Marieb et al. teaches a multilayer structure of interconnect conductive layer on a semiconductor substrate and teaches that an interconnect layer (110) of aluminum copper alloy has been completely wrapped around all sides by a second conductive material (see Fig 1D, lines 33-34 of column 3), and further teaches that such encapsulating the interconnect layer by the first material help prevent hillocking from the side walls since the second material is completely surrounding by the first material as opposed to the prior art structure where sides are generally exposed. Since the interconnect layer is completely surrounded by the second material, hillocking from any side of the wire is prevented , thus prevent electromigration (see Abstract and lines 42-47 of column 3).

Thus it would have been obvious to one having ordinary skill in the art at the time the invention was made to wrap the second part completely by the first part as taught by Marieb et al. since this will prevent hillocking from all sides of the interconnect wire, thus prevents electromigration.

Regarding claims 50, 54 and 58, Jones discloses that the first conductive material comprises chromium and second conductive material comprises copper (lines 59-60 of column 18, & lines 32-33 of column 17).

Claims 38, 47, 49, 51, 53, 55 and 57 are rejected under 35 U.S.C. 102(e) as being unpatentable over Raina et al. (US 6657376), in view of Marieb et al. (US 5909635).

The applied reference has a common inventor with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). This rejection might also be overcome by showing that the reference is disqualified under 35 U.S.C. 103(c) as prior art in a rejection under 35 U.S.C. 103(a). See MPEP § 706.02(l)(1) and § 706.02(l)(2).

Regarding claims 38, 47, 51 and 55, Raina et al. disclose an integrated circuit including plurality of devices (see Fig 1), a first layer of material comprising silicon (layer 54 of Fig 8, comprising silicon dioxide), a second layer of material comprising silicon (layer 66 comprising silicon dioxide), a first device (emitter tip 64), a second device (gate electrode 68, 70), and a conductor (56), the conductor electrically connecting the first and second devices (see relevant descriptions of Fig 4-8) at least a portion of the conductor being disposed between the first and second layers of material (see Fig 8), the conductor including a first part, a second part, the first part comprising chromium, the second part comprising aluminum (lines 14-18 of column 5).

But Raina et al. fail to disclose that the first part is forming a sheath completely wrapped around an upper surface, lower surface a left edge, and a right edge of the second part.

However, Marieb et al. teaches a multilayer structure of interconnect conductive layer on a semiconductor substrate and teaches that an interconnect layer (110) of aluminum copper alloy has been completely wrapped around all sides by a second conductive material (see Fig 1D, lines 33-34 of column 3), and further teaches that such cladding of the interconnect layer on the semiconductor substrate provides prevention of hillocking from all sides of the interconnect layer since it is completely surrounded by the second material, consequently provides improved electromigration performance (see Abstract and lines 57-60 of column 2 & 41-47 of column 3).

Thus it would have been obvious to one having ordinary skill in the art at the time the invention was made to wrap the second part completely by the first part, as taught by Marieb et al. since this will provide improved electromigration.

Regarding claims 49, 53, & 57, Raina et al. disclose that the first conductive material comprises chromium and second conductive material comprises aluminum.

Response to Arguments

Applicant's arguments filed 8 May 2006 have been fully considered but they are not persuasive.

Applicant contends:

(1) Marieb et al. fail to teach the formation of sheath that comprise chromium.

(2) Marieb et al. only teaches formation of sheath with titanium for improvement of electro-migration. Further Marieb et al. do not recognize or describe any wrapping will improve electro-migration.

In response to item (1) examiner agrees that the sheath of Marieb et al. do not comprise chromium rather comprise barrier material such as titanium.

In response to item (2), examiner respectfully presents that Marieb et al. describe Ti as the barrier metal for preventing hillocking as an example. Further teaches that instead of sepcific details such as titanum as barrier material or use of aluminum alloy, this invention can be practiced without **these** specific details (lines 58-66 of column 2).

Further, it is well known in the art that titanium, chromium and tungsten are barrier metal for preventing electromigration (see US 5470788, and US 6406997).

Moreover Jones uses chromium metal under and above the interconnect wire, as recognized by applicant.

It is the teaching of surrounding the barrier metal all around the interconnect wire from Marieb et al. provides the support for the combination of references in *prima facie* obviousness rejection.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Karabi Guharay whose telephone number is 571-272-2452. The examiner can normally be reached on Monday-Friday 9:00 am - 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimeshkumar D. Patel can be reached on 571-272-2457. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

KGuharay

Karabi Guharay
Primary Examiner
Art Unit 2879
7/13/06